

The structure and evolution of industrial clusters: Transactions, technology and knowledge spillovers

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Abstract

In this paper, we investigate the relationship between location patterns, innovation processes and industrial clusters. In order to do this we extend a transactions costs-based classification into a knowledge-based taxonomy of clusters, along the lines suggested by a critical revision of the main assumptions underlying most of the existing literature on spatial clusters. Our arguments show that the transactions costs approach and the innovation and technological regimes framework are broadly consistent, and that real insights into the microfoundations, nature, and evolution of clusters can be provided by these classification systems.

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1. Introduction

Over recent years, the interrelationships between technology, innovation and industrial location behaviour have come to be seen as essential features of regional development. Much research and policy-thinking has been devoted to understanding the factors explaining why particular types of technologies appear to blossom in particular localities, and how this affects local economic growth. Lessons are often drawn from observations of particularly successful ‘innovative’ regions

as a means of re-modelling both industrial and regional policy.

It will be argued in this paper that insufficient consideration is still devoted to both the nature of innovation processes and the structural conditions under which technical change occurs across space. In order to explain the observed variety of geographical models, it is necessary to take into account the nature of new knowledge in different production sectors. In particular, technological regimes, industrial structures and organisational practices, as well as their dynamics, are often overlooked in favour of simplified and stylised constructs, which appeal to consultants or government policy-makers wishing for easy answers to complex problems. An example of this is the literature promoting industrial clusters.

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This paper attempts to classify industrial clusters on the basis of the existing literature, trying in particular to integrate transactions costs views and innovation and technology perspectives to give account of both the diversity of cluster structures and the multiplicity of their evolution paths. In doing so, the following questions are here indirectly addressed. How can we explain the variety and distinctiveness of geographically bounded industrial clusters? Why particular types of technologies tend to thrive in particular localities? How do different types of clusters evolve over time?

The paper is structured into 10 sections. In the following section we discuss the various hypotheses which exist concerning innovation and geography. In Section 3 we outline the generally-held arguments regarding the relationship between geography and knowledge spillovers, and in Section 4 we present a transactions costs classification of different types of industrial clustering previously developed elsewhere, which is explicitly based on the implicit assumptions underlying most of the existing literature on agglomeration and clustering phenomena. Such a classification is very informative regarding identifying the nature and organisational logic of clusters, and on this basis Section 5 of the paper addresses the limits of the hypothesised advantages of clustering by considering the effects of unintended knowledge flows. Section 6 then explains the limitations of the transactions costs view in analysing the processes of cluster evolution, whilst Section 7 briefly introduces evolutionary perspectives on technical and structural change. Such perspectives are adopted in Section 8 to extend the transactions costs classification proposed in Section 4, in order to give an account of the diversity and multiplicity of possible evolutionary paths of industrial clusters. Section 9 uses selected empirical examples to show the importance of both transactions costs and knowledge regimes in explaining patterns of cluster development. Section 10 outlines some brief conclusions.

2. Hypotheses concerning the geography of innovation

In order to begin our analysis, it is necessary to review what is already known or assumed in the literature concerning geography, industrial location and innovation. Across the broad range of literature on innovation and growth processes, four distinct and substantially alternative hypotheses (Gordon and McCann, 2005a,b) have emerged in order to account for the widely observed uneven spatial distribution of innovative behaviour (Sternberg, 1996). We will examine each of these in turn.

Hypothesis 1. The contemporary geography of innovation is essentially a geography of the currently more innovative sectors of the economy.

This hypothesis takes off from the observation that in any period there are some sectors of economic activity which will be more heavily involved in innovation of products or processes than others. This may be because of the particular phase which has been reached in the life cycle of their product set, or because some activities with very short product cycles are more or less permanently locked into the innovative phase. If each of these industries is subject to rather different location factors, because of the nature of their production technologies, or their marketing or consumption processes, the geography of innovation may then be reducible simply to a geography of industrial location. With activities remaining in the same broad locations through all of the phases of the product cycle, places which they dominate will also appear to move through that cycle.

Hypothesis 2. The contemporary geography of innovation is essentially a result of spatial differences in the phases of product or profit cycles.

This alternative interpretation of product cycle geographies emphasises significant and typical shifts in the locational requirements between the phases of an industry's product or profit cycle (Vernon, 1960; Markusen, 1985). From this perspective, during the early innovative phases, access to appropriate skills and subcontractors are a crucial condition for successful innovation and the management of uncertainties. Later on, in the more mature phases of the cycle, when output scale has been achieved and when production methods have become routinised, cost factors are assumed to become increasingly important, thereby allowing both geographical dispersal to lower cost locations and also the spatial division of labour.¹ From this perspective, therefore, what is generally significant about the geography of innovative activities is the relationship between space and production cost conditions at different stages in the product cycle.

In terms of the assumptions underlying the relationship between innovation and geography, there is a fundamental difference between the first and the second

¹ This process may be slowed and such spatial decentralisation delayed or avoided by successful 'oligopolisation' of particular sectors (Markusen, 1985), which increases the likelihood that industries are born, mature and die in the same locations, as is assumed in Hypothesis 1.

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